Physics of the Human Body and Health

Physics · Practice Test · 12 Questions

1. The high electrical resistance of the skin, a key factor in avoiding electrical shock under normal, dry conditions, is primarily due to the presence of which substance in the outermost epidermal layer?

A) Keratin
B) Melanin
C) Collagen
D) Elastin

2. In the context of human circulation, the resistance to blood flow in a blood vessel is directly proportional to its viscosity and length, and inversely proportional to the fourth power of its radius. This relationship is a direct consequence of which physical law?

A) Bernoulli's Principle
B) Poiseuille's Law
C) Archimedes' Principle
D) Hooke's Law

3. The process of hearing involves the mechanical vibration of the tympanic membrane and ossicles, which then amplifies and transmits these vibrations to the cochlea. This amplification mechanism relies on the principle of mechanical advantage, similar to that found in:

A) A simple pendulum
B) A lever system
C) An elastic band
D) A frictionless pulley

4. The ability of the eye to focus on objects at varying distances is achieved by changing the shape of the lens. This process, known as accommodation, is governed by which physics concept related to how light bends?

A) Reflection
B) Diffraction
C) Refraction
D) Interference

5. The pressure exerted by blood within the circulatory system, crucial for effective perfusion of tissues, is generated by the pumping action of the heart. What fundamental physics principle describes the relationship between the force applied by the heart and the resulting pressure within the confined volume of the blood vessels?

A) Pascal's Principle
B) Charles's Law
C) Boyle's Law
D) Ideal Gas Law

6. The movement of ions across cell membranes, essential for nerve impulse transmission and muscle contraction, often involves facilitated diffusion or active transport. These processes are fundamentally governed by principles of:

A) Quantum mechanics
B) Electromagnetism and diffusion
C) Gravitational forces
D) Nuclear physics

7. Thermoregulation in the human body, the maintenance of a stable internal temperature, involves heat transfer mechanisms. Which of these mechanisms is the primary means by which the body loses heat to a cooler environment when not sweating or exposed to wind?

A) Conduction
B) Convection
C) Evaporation
D) Radiation

8. Diagnostic imaging techniques like X-rays utilize the differential absorption of electromagnetic radiation by various tissues. Bone, being denser and containing more calcium, absorbs X-rays more effectively than soft tissues, leading to the contrast observed in images. This phenomenon is a direct application of:

A) Photoelectric effect
B) Compton scattering
C) X-ray fluorescence
D) Attenuation of radiation

9. The bending of light rays as they pass from one medium to another (e.g., from air to the cornea or lens of the eye) is critical for vision. This bending is described by:

A) Huygens' Principle
B) Snell's Law
C) Fraunhofer Diffraction
D) Fermat's Principle

10. The electrical potential difference across a cell membrane, vital for cellular communication, is maintained by ion pumps and channels. The movement of ions and the resulting charge separation are governed by:

A) Thermodynamics
B) Electromagnetism
C) Classical mechanics
D) Relativity

11. In physiotherapy, ultrasound therapy uses high-frequency sound waves to generate heat and promote tissue healing. The mechanical vibrations of sound waves are a form of:

A) Electromagnetic wave
B) Kinetic energy transfer
C) Potential energy storage
D) Chemical energy release

12. The sensation of balance and spatial orientation in the inner ear is managed by the vestibular system, which contains fluid-filled semicircular canals. The movement of this fluid in response to head rotation is an example of:

A) Rotational inertia
B) Centrifugal force
C) Angular momentum
D) Fluid dynamics (inertial effects)